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**Abdulrazak Abyad**  
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This year was a good year for the journal as judged by the quality and nature of papers received. Research and writing on nursing issues is still lagging behind in the region and more effort should be put in to encourage that.

A paper by Dr Al Moutaz reviewed the issue of Infection with chronic diabetic wounds. The authors stressed that wounds are a nightmare for diabetics. Most of diabetics are afraid of being injured. The authors discussed the risk factors of infection in chronic wound and the signs of infection in these wound as well as discussing the differences between superficial and deep infection.

A paper from Jordan looked at the Effect of Providing Information to Prevent Lymphedema among Treated Breast Cancer Women. The author stressed the fact that Breast cancer is the most common cancer affecting women worldwide and the leading cause of cancer death globally in women. Clinically, many women treated for breast cancer have not received any information about lymphedema and risk reduction. The author discussed the nursing interventions and clinical implications related to lymphedema. Education should address skin care; for example, breast cancer survivors should avoid skin breaks when possible and should treat cuts, insect bites, and burns immediately with a topical antibiotic.

Dr Al-Motlaq looked at Asthma and the Cumulative Effects of Climate Change, the Financial Crisis and Swine Influenza. The health implications of these three issues are discussed, along with the need to consider these issues when formulating asthma management plans and rural health policy.

A record-based descriptive study was conducted on 400 infants less than six month of age selected by systematic random sample from three primary health care centers in Sakaka city Saudi Arabia. The aim was to estimate the exclusive breastfeeding rate, explore factors associated with it and its effect on infant morbidity. The authors concluded that maternal work had a negative effect on exclusive breastfeeding. Exclusive breastfeeding protects against infectious and non-infectious disease during the first six months of life.

In another paper from Jordan the author aims to identify barriers to effective cancer related fatigue management. The search identified 100 studies, and 20 studies were included. Researchers have advocated that control of (CRF) can be improved through patient education, and helping patients to communicate their fatigue to healthcare providers; also routine fatigue assessment, and treatment should be offered in the clinical sitting. Limited research efforts have been directed toward developing or evaluating strategies to reduce those barriers, more study is needed to determine the extent to which targeting key barriers can reduce CRF.

# EXCLUSIVE BREASTFEEDING AND INFANT MORBIDITY IN SAKAKA CITY, SAUDI ARABIA

## Abstract

**Background:** Exclusive breastfeeding is optimal for infant growth and protection against infectious disease during the first 6 months of life.

**Objectives:** to estimate the exclusive breastfeeding rate, explore factors associated with it and its effect on infant morbidity in Sakaka city, Saudi Arabia.

**Methods:** A record-based descriptive study was conducted on 400 infants less than six month of age, selected by systematic random sample from three primary health care centers in Sakaka city.

Some maternal and infant data was abstracted from family and infant's files. Feeding pattern, number of sickness visits, any disease and weight for age were abstracted from infant's files and growth charts.

**Results:** Only 16.2% of the infants were on exclusive breastfeeding at the last vaccination session. Exclusive breastfeeding was significantly higher among housewives, highly educated mothers, normally delivered infants, and infants with younger age. Exclusive breastfeeding was associated with lower number of diseases during the past six months, less sickness visits to the health center, and lower incidence of lower respiratory tract infections, otitis media, bronchial asthma, gastro-enteritis and skin allergy.

**Conclusions:** maternal work had a negative effect on exclusive breastfeeding. Exclusive breastfeeding protects against infectious and non-infectious disease during the first six months of life.

**Key words:** Exclusive breastfeeding, Infant morbidity

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## Introduction

There is a universal consensus about the fundamental importance of breastfeeding for children's adequate growth and development and their physical and mental health. No artificial feeding formula is capable of qualitatively replacing breast milk, and its specific nutrients and protection against diseases (1). Despite this the prevalence of exclusive breastfeeding remains far from the desirable levels.

Breastfeeding is a complex process governed by psychological and physiological factors, which in turn are conditioned by a wide spectrum of environmental, socioeconomic and cultural circumstances. The factors affecting breastfeeding vary according to the economic and sociocultural environment (2).

Research in both developed and developing countries of the world has provided strong evidence that human milk feeding decreases the incidence and/or severity of a wide range of infectious diseases (3) including respiratory tract infections (4-7), otitis media (7-9) and diarrhea (7,10-12). Some studies have suggested decreased rates of overweight and obesity (13-15) and asthma/wheeze (7,16-18) in

older children who were breastfed. Additional research in this area is warranted.

Despite the demonstrated benefits of breast milk, the prevalence of breastfeeding, in particular exclusive breastfeeding, in many developing countries including Saudi Arabia, is lower than the international recommendation of exclusive breastfeeding for the first six months. The objectives of this study are to estimate the exclusive breastfeeding rate, explore factors associated with it and its effect on infant morbidity in Sakaka city, Saudi Arabia.

## Materials and Methods

This is a record-based descriptive study done in Sakaka city, Saudi Arabia during the period of four months from February to May, 2011. Sakaka is the capital city of Al Jouf region. The primary health care is provided through a network of 9 primary health care centers (PHCC). Three PHCCs (Elteweer, Elshalhope, and Elshamaly) were selected for implementation of the study; these centers represent different geographical distributions and social strata of the city.

The target population is infants less than 6 month of age who received vaccination at the chosen PHCC during the study period. The

exclusion criteria are non-Saudi infants, non-resident of Sakaka city, low birth weight, premature infants, congenital malformations, chronic diseases and genetic disease, and infant with incomplete health record.

EPI INFO Statistical program was used to calculate the sample size. A pilot study done on 60 records of infants less than 6 months (not included in the full scale study) revealed that about 15% of them were exclusively breastfed. A total of 823 Saudi infants less than 6 months were registered at the chosen PHCCs during the study period. With the worst acceptable level of exclusive breastfeeding of 12%, the required sample size was about 328 at 95% confidence level. In each center a systematic sample (every 2nd file) was selected from the infants' files kept at PHCCs. Files with exclusion criteria were replaced by the next file. So a total of 400 files were included in the study.

Data was abstracted from the infant and family file. Mother's data included age, parity, education, working status, mode of delivery. Infant data included age at last visit, sex, type of feeding (whether exclusive, breastfeeding, partial breastfeeding or exclusive formula feeding), number of sickness visits to the PHCC during the past 6 months and diseases diagnosed during these visits, were studied in details.

Weight for age was abstracted from the infant's growth chart and is presented as underweight, normal weight or overweight. Percentile growth charts were completed during the routine vaccination visits to the PHCC. Exclusive breastfeeding was defined as the infant has been given only breast milk since birth.

Ethical consideration: the study was approved by Al Jouf Directorate of Health and Faculty of Applied Medical Sciences, Al Jouf University.

Data was analyzed using SPSS version 16. Variables were presented

as number and per cent. Chi square test or Fisher's exact test was used for group comparison, as appropriate.  $P < 0.05$  was considered statistically significant.

## Results

Among the 400 infants involved, only 16.2% of them were on exclusive breast-feeding at the last visit to PHCC; about half of them (49.5%) were on partial breastfeeding and the remaining 34.2% were on exclusive formula feeding.

Exclusive breastfeeding rate was significantly higher among housewives, highly educated mothers, normally delivered infants, and infants with younger age (Table 1). Exclusive breastfeeding was associated with lower number of diseases during the past 6 months, less sickness visits to the health center, and less incidence of lower respiratory tract infections, otitis media, bronchial asthma, gastro-enteritis and skin allergy (Table 2 - page 6).

## Discussion

Exclusive breastfeeding is endorsed by the World Health Organization as the ideal food for infants from birth to six months, because of its nutritional superiority over commercial formula (1,19,20) and the significant protection afforded to the infant against acute diseases (21).

In this study only 16.2% of infants less than 6 months of age were on exclusive breast-feeding. This is much lower than the international recommendation.

Much higher rates of exclusive breastfeeding were reported from other developing countries e.g. 38% in Gaza strip (22), 42.5% in Egypt (23), 70% in Palestine (24), 49.8% in Tanzania (25), 76.5% in Nigeria (26), 49.0% in Ethiopia (27), 24% in North Vietnam (28), and 38% in Brazil (29). In Rotterdam, Netherlands, 26% of infants BF exclusively until the age of 4 months. Only 1.4% of all infants were exclusively BF for 6 months (30).

This study revealed that mother's work is negatively associated with exclusive breastfeeding. A previous study in Al-Hassa, Saudi Arabia reported that none of the working mothers breastfed exclusively compared to 36.7% of house wives (31). In Saudi Arabia, working mothers are allowed a maximum of two months of compensated maternity leave. It was commented that not being able to take time off work is the main reason not to breastfeed among working mothers (32,33). Similar results were reported from Egypt (23,34,35), Xinjiang, China (36), in Nigeria (26) and in North Vietnam, the risk of not exclusive breastfeeding was 14 times greater for women who had returned to work than women who had not (28). However, a study in Nicaragua, found no association between maternal work and exclusive breastfeeding (37).

We found that more educated mothers are more likely to breastfeed exclusively than less educated and non-educated mothers. Previous studies reported contradictory findings. In Rotterdam, Netherlands, more educated mothers tended to breastfeed their infants longer and more exclusively (30). However, the association of higher maternal education with exclusive breastfeeding was reported from Palestine (24) and Nicaragua (37). In Nigeria, mother's education is not associated with exclusive breastfeeding (26).

In agreement with previous studies (23,24), Caesarean delivery has adverse effects on exclusive breastfeeding. Anesthesia and pain after section suppress milk production and delays breastfeeding initiation and continuation.

The exclusive breastfeeding rate decreased as infant's age increased. Similar results were reported from both developed and developing countries (27,28,30). With advanced infant's age, more supplementary feeds were introduced.



	Total	Exclusive breastfeeding N (%)	Significance test
Overall	400	65(16.2)	
Maternal age (years): <25	109	11(10.1)	$\chi^2=4.5$ ;P=0.1
25-	246	47(19.1)	
35 & more	45	7(15.6)	
Birth order: First & second	227	34(15.0)	$\chi^2=4.3$ ;P=0.1
Third & fourth	142	29(20.4)	
Fifth & more	31	2(6.5)	
Mode of delivery: Normal	326	62(19.0)	$\chi^2=9.9$ ;P=0.002
Caesarean section	74	3(4.1)	
Mother's education:			$\chi^2=7.7$ ;P=0.021
Less than secondary	95	7(7.4)	
Secondary	172	30(17.4)	
Above secondary	135	28(20.7)	
Mother's work:			$\chi^2=7.7$ ;P=0.006
Working/student	97	7(7.9)	
House wife	303	58(19.1)	
Infant age:			$\chi^2=10.4$ ;P=0.006
Less than 2 months	122	29(23.8)	
2-4 months	136	23(16.9)	
4-6 months	142	13(9.2)	
Infant's sex: Male	209	36(17.2)	$\chi^2=0.3$ ;P=0.6
Female	191	29(15.2)	

**Table 1: Factors associated with exclusive breastfeeding**

When given exclusively, breastfeeding reduces the risk of infectious disease in infants in developing countries (38,39).

Breast milk transports nutrients, affects biochemical systems, enhances immunity and destroys pathogens. All types of

immunoglobulin are found in human milk, however, both Ig A and Ig E play a critical role in biological specificity of human milk on recipient infant. Non-antibody factors (e.g. lactoferrin, the bifidus factor and oligosaccharides) in human milk comprise an elegant and intricate system that protects the infant against bacterial infection (40). This

explain the significant reduction of sick clinic visits and the fewer illness episodes observed in this study and reported by previous studies (26,41).

We found that the risk of lower, but not upper, respiratory tract infections is much lower among exclusively breastfed infants. A Palestinian

	Exclusive breastfeeding		Significance test
	Yes (65)	No (335)	
Any disease	29(44.6)	241(71.9)	$\chi^2=18.5; P\leq 0.001$
Sickness visits: None	44(67.7)	128(38.2)	$\chi^2=19.5; P\leq 0.001$
One	13(20.0)	117(37.9)	
Two & more	8(12.3)	90(26.9)	
Upper respiratory tract infections	14(21.5)	97(29.0)	$\chi^2=1.5; P=0.2$
Lower respiratory tract infections	0	22(6.6)	FET, $P=0.03$
Otitis media	1(1.5)	32(9.6)	$\chi^2=4.6; P=0.03$
Bronchial asthma/wheezing	0	36(10.7)	$\chi^2=7.7; P=0.006$
Gastroenteritis/diarrhea	0	38(11.3)	$\chi^2=8.1; P=0.004$
Skin allergy/Eczema	3(4.6)	52(15.5)	$\chi^2=5.5; P=0.02$
Infant weight: Under weight	3(4.6)	27(8.1)	$\chi^2=7.6; P=0.02$
Normal weight	60(92.3)	261(77.9)	
Overweight	2(3.1)	47(14.0)	

FET=Fisher's Exact test

**Table 2: Impact of exclusive breastfeeding on infant health**

study reported the same finding (24). However a recent study in the Netherlands, reported that exclusive breastfeeding was associated with a significant reduction of both upper and lower respiratory tract infections (30).

The risks of otitis media and bronchial asthma/wheezing were lower among exclusively breastfed infants. This is in agreement with the Palestinian study (24). Furthermore, the rate of skin allergy/eczema was lower among exclusively breastfed infants. It was hypothesized that exclusive breastfeeding is a protective factor for development of atopic dermatitis if compared with conventional cow's milk formula (42).

Breast milk is safe and free of any contaminating organism. So the risk of gastroenteritis is lower among exclusively breastfed infants. Similar results were reported from

Palestine (24), Zimbabwe (41) and the Netherlands (30).

Breast milk without any supplementations is optimal for infant growth during the first six months of life. We found that exclusive breastfeeding was associated with lower risks of both underweight and overweight. This is in agreement with other studies (26,43).

In conclusion, exclusive breastfeeding is not optimal in Sakaka city, especially among working mothers, after caesarean delivery and with increasing infants' age. The lack of exclusive breastfeeding is associated with increased infant illness (lower respiratory tract infection, otitis media, bronchial asthma and gastroenteritis) and consequently more sickness visits to the health center.

Our findings support the need for a health policy strategy to promote exclusive breastfeeding for six months. Extension of the duration of compensated maternity leave will contribute to the promotion of exclusive breastfeeding.

The results suggest an education program aimed to correct inappropriate breastfeeding perceptions and promote exclusive breastfeeding in Sakaka.

Biological, cultural and social constraints related to exclusive breastfeeding habits need to be studied more extensively at the community level. Qualitative research methods can increase these studies' explanatory capacity. Health authorities must give more concern to exclusive breastfeeding during planning for fighting against infectious diseases. The effects of exclusive breastfeeding on infectious

diseases at older ages remain to be studied.

The strength of this study is that all illness or diseases were professionally diagnosed by physicians in primary health care centers. The possibilities of mothers' recall bias or misdiagnosis are not existent. However, it suffers from many limitations. Trivial illnesses not necessitating consultation were not included. Also sickness visits to other health facilities (e.g. private sector, or emergency hospital visits) were not included. Being record-based we are only able to study a limited number of factors associated with exclusive breastfeeding. The findings of this study cannot be generalized to the whole nation.

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# ASTHMA AND THE CUMULATIVE EFFECTS OF CLIMATE CHANGE, THE FINANCIAL CRISIS AND SWINE INFLUENZA

## Abstract

Asthma continues to be a major health problem worldwide, with higher morbidity and mortality among rural and low-socioeconomic groups. This paper examines the cumulative impact of three contemporary issues on people with asthma, particularly those living in rural areas: climate change, the financial crisis, and the recent outbreak of swine influenza A (H1N1). These three issues, that have received extensive global and national publicity over the last couple of years, add to the many other factors known to affect the health and wellbeing of people with asthma. The health implications of these three issues are discussed, along with the need to consider these issues when formulating asthma management plans and rural health policy.

**Keywords:** asthma, climate change, the financial crisis, swine influenza, rural health, health policy

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## Introduction

Asthma is a major health concern in the developed world and recently in developing countries(1). The illness is known to have a major effect on the health status and quality of life of patients(2, 3) and can lead to death (4). The prevalence of asthma has increased in recent decades. Studies have shown a marked difference in the prevalence between urban and rural regions(5). Although more prevalent in urban areas, people with asthma living in rural and remote areas have higher morbidity and mortality rates, and a higher rate of hospitalization than their urban counterparts(6, 7). These figures have been attributed to difficulty obtaining information about asthma management, less access to acute hospital services(7), having to travel longer distances to access health care services, and lower socioeconomic status(8).

Although there exists extensive literature that demonstrates the direct or indirect effect of a wide array of physical, psychological and social factors on the health status and quality of life of people with asthma, the focus of this paper is on three contemporary issues that have generated widespread public interest and concern; namely climate change, the financial crisis and the swine influenza A (H1N1) pandemic. While considerable media attention has been given to these issues and their effects on health and wellbeing, little attention has been given to the cumulative effect on people with asthma in rural areas. The purpose of this paper is to raise awareness of the health consequences and

relevance to asthma management and rural health policy.

## Asthma and climate change

Modern climate change involves changes in the weather patterns as a result of increasing Earth's temperature, a state known as global warming. The global warming, which is caused by excessive emission of greenhouse gases into the air, has negatively affected the demographics and economics of nations(9). This change is associated with extreme, more frequent and widespread weather events(10). Health hazards of climate change and El Nino-related weather events are well established in the literature(9). Although not proved to be the major factor, recent increase in asthma prevalence might be related to climate change effect whether it is a result of increased CO<sub>2</sub> concentration in the atmosphere or the effect of the change on different triggering factors of asthma(11). Evidence exists to suggest that climate change had and will have impacts on aeroallergens(12). Studies have shown increased allergic disorders such as asthma because of earlier and longer pollen seasons in addition to the change in geographic range of these triggers(9). Air quality was proved to have significant effect on increasing hospitalization rates as well(13, 14). Climate change projections indicate more devastating and extreme bushfire seasons(15) which make it difficult for patients with asthma to control their illness. It is believed that the

indirect effect of climate change is more prominent in the country than the city(16) were communities battle against the negative effect of the weather(17). Given their difficulty accessing health care facilities, patients of rural and remote areas from low socioeconomic status are at higher risk of complications from these changes(7, 8).

### **Asthma and the financial crisis**

Socioeconomic status plays a major role in shaping the health of individuals, groups, and nations. The recent financial meltdown has had an enormous effect on the health sector and the health of individuals. Lessons learned from previous experiences show less money will be allocated for healthcare(18) which will affect the quality of life of patients. The image always had been that asthma is more prevalent in industrialized countries(19) though recent studies showed similar trends in the developing world(20). Studies varied in linking socioeconomic status prevalence and severity of asthma(21-23) showing increased prevalence of asthma was associated with improved social circumstances whereas severity was associated with poverty(23, 24). The higher severity of asthma among low socioeconomic groups than in high socioeconomic groups might be attributed to their less frequent use of asthma drugs(25). Moreover, the prevalence of asthma among indigenous people is higher than their non-Indigenous counterparts(26) as they have less access to health care combined with their lower socioeconomic status(27). In the context of rural management of asthma many factors can play a role including socioeconomic status of families and access to health care(8) which is why educating about asthma is simply not sufficient(28).

Beside the hardships faced by patients with asthma in rural areas, the financial crisis has added another dimension of burden. The recent financial crisis, impacted on hundreds of companies and charities. Consequently, funds

allocated for healthcare and to other contemporary climate change issues have been negatively affected. Charities have reduced their activities and voluntary worker numbers and hours they contribute have also decreased, increasing demands on publically funded services(29). The socioeconomic status of a nation may not impact on the prevalence of asthma at any given time; however there is a direct relationship to Government expenditure on disease management and related research(30). With less funds allocated to disease management patients are at greater risk. In addition, job losses and lack of opportunities plays a major role in the level of care an individual receives. People in times of financial crises tend to turn from private to public sectors. Insufficient funding of these high demand services can lead to deterioration in the quality of care that can be provided(30). That's why in such times the WHO recommends a pro-poor and pro-health spending approach. Therefore, it is important to ensure easy access and quality of health care services for rural residents(31).

### **Asthma and swine influenza**

Respiratory infections including influenza are the most common triggers of asthma(4) and patients with asthma are at higher risk of experiencing adverse outcomes(32). Although declined worldwide, the flu danger is still standing especially with its seasonal outbreak. The recent swine flu outbreak placed patients with asthma at higher risk for complications of swine influenza A (H1N1) virus infection(33). Given the high prevalence of asthma in rural communities besides the rural population's vulnerability to complications from the flu, a widespread outbreak of the swine flu could lead to unwanted consequences.

The influenza vaccination is recommended(4) and can be safely used with asthma patients(34) and after adjustment for severity, influenza vaccine was proved to protect against acute

exacerbations(35). Killed-virus vaccines have shown efficacy for the prevention of influenza in patients with asthma(36) and hence decrease hospitalizations and other complications due to influenza-associated outcomes. However, it would be difficult to provide enough vaccine in a time to protect against new viruses(37) particularly in times of financial constraints. Some recent studies even revealed that people are no longer afraid of the disease and not thinking of getting the vaccine as they respond to the outbreak based on their perception of risk(38). Therefore, asthma plans need to be weighed against the increased cost on patients, vulnerable communities, and the demand on the local health services. Although most cases fully recover, unregistered cases should also be taken into consideration.

### **Discussion**

They say if you keep putting more straw on top, it will finally break the camel's back. The adverse impacts of an issue is often oversimplified as being individual but it is the cumulative effect of many issues that potentially have a major impact. Issues that have received increasing attention recently have combined and have important effects on patients with asthma. The cumulative impact of different issues is the added effect of the past and present issues. The magnitude of this effect is expected to escalate when all of these issues present at once. In many studies, environmental changes; social hardships; pandemics; financial problems; and many other crises have had and will always have their effect on unhealthy groups, including patients with asthma.

Climatic change has been blamed for generating new health problems. The change in the nature of the earth has been linked to developing these issues or escalating them by increasing their risk or range of effect. Respiratory problems are exacerbated by poor quality air that can be related to pollution(39). Governments around the globe have shown interest in taking action to

restrict greenhouse gas emissions by attending the 2009 Copenhagen Climate Change summit. However, many were disappointed with the main outcomes supported by the conference; that did not include any binding agreements(40).

Moreover, the financial crisis brought new challenges to health workers and policy makers. The downturn of the economy shrank the allocated resources for managing health problems, an investment that mainly relies on charities and individual spending which have been affected by the financial crisis as well. What does this mean to patients with asthma? The following few years might bring bad news, with more resources required to maintain current levels of asthma management, as the World Economic Forum warned that the financial crisis is inevitable(40). The financial burden on families and health systems might increase in times of world finance going through recession. It is known that people with asthma from lower socioeconomic groups and ethnic minorities continue to receive inadequate and episodic care. Consequently, the effect of these problems increases the burden on the sufferers.

Recently, swine flu was declared a pandemic across the world by the WHO. It is probable that this pandemic may increase the risk of poor health outcomes for the people with pre-existing major health conditions such as asthma. In western countries, the prevalence of asthma is very high reaching up to 25% in some regions. With this high percentage of people with asthma, a higher risk exists of the flu and this should be taken seriously by the nations' health systems. Globally, the WHO has confirmed thousands of deaths from the illness with only a fraction immunized(40).

The cumulative effect of these combined issues is clear for a patient with asthma. The climate change increased prevalence of

asthma and its triggering factors; the financial crisis has affected plans to fight climate change while climate change affects the rural finance system, putting more constraints on rural families with asthmatic members. For example, the impact of climate change on a wide range of holiday destinations is mainly manifested by its effect on the tourism industry (41) particularly in rural destinations. Finally, swine flu and its projected mass effect over rural communities has broken the camel's back. Population vaccination might be useful in controlling an influenza pandemic. However, financial constraints may restrain vaccination research and administration, and implementation of disease monitoring and reporting systems. These three significant issues, when they come together, have an enormous effect on asthma patients.

It is recommended that health care providers should consider their asthmatic patients' social environments(42) and socioeconomic status(21) when devising treatment plans. When planning care and giving advice, cost effective (affordable and feasible) solutions must be offered for families(28). In addition, policy makers should consider these issues in combination when formulating asthma management plans, especially in rural areas. Unless clear plans are put forward regarding proper procedures in times of hardship, it is likely that each system and body will handle matters a little bit differently and maybe incorrectly. Ministries of health, education, finance, tourism, agriculture and environment should come together and plan comprehensively.

## Conclusion

Management plans developed to address a problem in one community or time can directly be challenged as insufficient or inappropriate for another group or time. Success in dealing with these issues requires a more integrated approach which is flexible and able to include the newly emerged

events with previous management plans. Not all of the associated risks for asthma exacerbation are present in a single case of asthma sufferers, nor are they necessarily arranged in sequential order, but the cumulative effect of these issues might put patients and systems at risk. To summarize, documentation of the cumulative effect of the many recent issues on people with asthma can help policy makers' act properly. There is no doubt that many factors (social, psychological, environmental) can have an effect on asthma sufferers. However, these should be included in the policies and considered in the management plans. The combined effect of these factors is not just realistic but essential to consider.

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# BARRIERS TO EFFECTIVE CANCER-RELATED FATIGUE MANAGEMENT

## Abstract

Fatigue is the most common symptom associated with cancer that can affect a patients' physical, psychosocial, and cognitive functioning, as well as their quality of life. There are many barriers that make cancer-related fatigue (CRF) poorly assessed and managed in the clinical setting. This article aims to identify barriers to effective cancer related fatigue management. The search identified 100 studies, and 20 studies were included. Barriers to the management of CRF have been identified in three categories of patient related barriers, professional related barriers, and system related barriers. Many barriers contribute to why (CRF) is poorly managed in the clinical setting. Recommendations and guidelines for effective (CRF) management are widely available; however, patients continue to poorly communicate their fatigue to healthcare providers and this is related to lack of knowledge to possibility or availability of fatigue treatment. Also Healthcare Providers may be unwilling to initiate discussion about fatigue with patients, particularly if they are unaware of available treatments. Even when patients report their fatigue, it may not be taken seriously by health care providers. Although interventions designed to raise the awareness of patients seem to help in controlled research studies, much still needs to be done to address this problem. Researchers have advocated that control of (CRF) can be improved through patient education, and helping patients to communicate their fatigue to healthcare providers. Also routine fatigue assessment, and treatment should be offered in the clinical setting. Limited research efforts have been directed toward developing or evaluating strategies to reduce those barriers. More study is needed to determine the extent to which targeting key barriers can reduce CRF.

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## Background

Fatigue is the most common symptom associated with cancer and cancer treatment. It can have a major affect on a person's quality of life. It is estimated that its prevalence ranges from 18 to 90% among patients and survivors (Davis, Lai, Hahn, & Cella, 2007). Before anything can be done to treat fatigued patients health care providers must know the level of fatigue, or how bad their fatigue is.

The National Comprehensive Cancer Network in the United States (NCCN) defines cancer related fatigue (CRF) as "a persistent and subjective sense of tiredness that can occur with cancer or cancer treatment that interferes with usual functioning." CRF often begins before cancer is diagnosed, worsens during the course of treatment, and may persist for months, even years, after treatment ends (Christine et al., 2008). CRF can be caused by many factors; physical factors include anemia, various metabolic disturbances and malnutrition, and the psychological factors include depression, anxiety and lack of sleep (Morrow, 2007). It is a multidimensional symptom and the subjectivity of CRF makes it seldom assessed and treated in clinical practice (Russell, 2000). Recently there is increasing interest in CRF and its effect on patients' psychosocial and cognitive functioning, as well as their quality of life, that has lead to increased assessment and management of CRF methods. Several method to

assess CRF have been developed; multidimensional scales to evaluate general, physical, activity, motivation, and mental dimensions, and unidimensional scales to detect the availability and severity of symptoms (Pascal et al., 2007). Studies have shown that CRF can be managed effectively using a combination of pharmacological and non-pharmacological approaches (i.e., Exercise, Energy conservation and activity management, erythropoietin to correct anemia, and psycho-stimulant drugs) (Sandra et al., 2006; Victoria., 2004). The NCCN guidelines for the assessment and management of cancer-related fatigue can provide practical help to improve the diagnosis and management of CRF. Unfortunately, CRF remains poorly managed and treatment approaches are almost never offered (Gregory et al., 2000). This is suggested by several studies. For example, with lack of awareness regarding any possible treatments for fatigue, patients with cancer stated that they had not spoken to healthcare providers about fatigue; and even those patients reported their fatigue is under estimated by healthcare providers (Curt et al., 2000). CRF is a real symptom that should not be ignored. It can be worse when a person is dehydrated, anemic, in pain, not sleeping well, or has an infection. The purpose of this literature review is to identify the barriers to effective cancer-related fatigue management, and to suggest areas where additional research would assist in understanding the current state of medical care in regard to CRF.

## Methods

A series of literature searches was conducted using the electronic databases of Pub Med, Ovid and Medline for articles published between 2000 and 2010. The following key words were used to search the electronic databases: cancer, fatigue, management, treatment, barriers. Additional searches were conducted via the reference lists of selected articles. Studies were identified that met the following inclusion criteria. Firstly, studies had to focus on barriers to CRF management. Secondly, studies had to contain either information on the prevalence of CRF, assessment and management of CRF. Thirdly, studies that describe the Impact of Cancer-Related Fatigue on the Lives of Patients; Fourthly, patients' perception of CRF. The original language of the studies was restricted to English. The search identified 100 studies and 20 studies were included. Barriers for CRF management are identified in the three categories of patient related barriers, healthcare providers related barriers, and system related barriers.

## Results

### Patient-related barriers:

Lack of awareness among patients regarding any possible treatments for fatigue prevents patients talking with their doctor if they experience signs of fatigue before, during or after treatment. A study involving 200 patients showed that patients had never spoken to their doctor about fatigue (66%). The most frequently reported reasons for this lack of patient communication about fatigue included the doctor's failure to offer interventions (47%), patients' lack of awareness of effective treatments for fatigue (43%), a desire on the patient's part to treat fatigue without medications (40%), and not wanting to complain to the doctor (28%) (Steven et al., 2002). Because fatigue cannot be directly observed, the need for treatment may be overlooked. A study involving 576 outpatients showed that fewer than 50 percent of patients discuss fatigue with their health care providers; because they feel nothing can be done; that fatigue is

inevitable (43%), unimportant (34%), or untreatable (27%) (Stone et al., 2000). Patients believed that fatigue would not persist much longer, or was caused by cancer (Gregory et al., 2000). Studies have found that patients typically do not volunteer this information unless specifically asked (i.e. "How is your fatigue?" versus "How are you?") (Russell & Loretta, 1999). The effective doctor-patient communication is the cornerstone of successful fatigue treatment; however, poor communication between fatigued patients and their physicians remains a pervasive problem (Patricia, 2002).

### Healthcare providers-related barriers:

Cancer-related fatigue is a symptom that is still ignored, under-recognized and under-treated (Eileen & Joan, 2003; Stone et al., 2000; Steven et al, 2002). A major barrier to fatigue management is the lack of knowledge about its underlying causes. Healthcare providers may be unwilling to initiate discussion about fatigue with patients, particularly if they are unaware of available treatments. Even when patients report their fatigue, it may not be taken seriously by health care providers. Health care providers place more emphasis on treating pain and nausea than fatigue, although fatigue has a very similar effect on quality of life (National Institutes of Health State, 2002). In two surveys, one involving 109 physicians and another involving 160 nurses, it was revealed that over half of the physicians believed that fatigue was something that patients must live with. The vast majority of respondents reported that they believe nausea to be the side effect of most concern to their cancer patients. In contrast, 41% of 143 patient respondents to a third survey reported that fatigue was the side effect that had the greatest impact on them (Eileen & Joan, 2003). Very few patients who had experienced fatigue in the previous month (75 of 538, 14%) reported that they had been prescribed or recommended any treatment by any healthcare providers. The most common advice

(39 of 75) was to take rest and relaxation, blood transfusions (18 of 75), and 'drug treatments' (13 of 75) were also recommended. Only 4% (6 of 75) of patients were advised to take exercise (Stone et al., 2000).

### System related barriers:

Assessment and management of fatigue is often not a priority. Thus, the health care provider is not reminded that fatigue should be assessed and documented routinely (Payne, 2002). Documentation of fatigue assessment and management in the medical record is not a common requirement in most healthcare institutions (Tami et al., 2007). Limited assessment on the part of clinicians may be accompanied by inexperience in using some of the approaches that have been empirically recommended (Portenoy & Miaskowski, 1998). Lack of specific tools to measure fatigue has created difficulties in establishing assessment and management guidelines. Including the stimulant drugs and non-pharmacological therapies such as exercise and cognitive interventions, constraints in the systems of care, including the lack of reimbursement for some of these recommended approaches, also contributes (Russell, 2000). Healthcare reimbursement may be a barrier, affecting the availability of medications, prescription practices, or referral patterns such as for psychiatric or relational support, physical therapy, nutritional support, or erythropoietin therapy (Tami et al., 2007).

## Conclusion

The literature review suggests that fatigue is still under-recognized and poorly managed in the clinical setting. The main barriers to fatigue management were patients and healthcare providers because their attitude, lack of awareness, and poor communication between them has a remarkable negative influence on CRF management. Among patient-related barriers, patients' beliefs regarding CRF fatigue would not persist much longer, or that CRF is an inevitable symptom caused by

cancer, and lack of their awareness regarding any possible treatments for fatigue prevent them from communicating their fatigue to health care providers. Healthcare providers believe that fatigue was something that patients must live with. Lack of awareness regarding the underlying causes for CRF, and the availability of treatments prevent them from initiating discussion about CRF, so that CRF remains poorly managed and ignored by health care providers. The most significant barrier among patients and professionals was poor communication between them.

## Recommendation

The literature review indicated several patients, healthcare providers, and system related barriers that affect fatigue management. If we are to deliver a high quality of care to those patients in the future, the recommendation identified by this review must be tackled with much enthusiasm. Effective healthcare provider-patient communication should be considered at each clinic visit. Patients and healthcare providers' awareness is highly required, to improve fatigue communication, and may be necessary to relieve the communication barriers that may exist in practice settings. Fatigue should be routinely assessed in the clinical setting, and treatment for CRF should be offered. The findings of this study can guide future studies that are needed to achieve effective treatment for CRF. More research is needed for developing strategies to reduce those barriers to fatigue management. Studies to improve educational measures for both patients and health care providers are needed, and another study is needed to determine the extent to which targeting key barriers can reduce CRF and improve patient's quality of life.

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# THE EFFECT OF PROVIDING INFORMATION TO PREVENT LYMPHEDEMA AMONG TREATED BREAST CANCER WOMEN

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## Introduction

Breast cancer is the most common cancer affecting women worldwide and the leading cause of cancer death globally in women (Nielsen, 2008). Annually, more than 1.2 million people are diagnosed with and treated for breast cancer worldwide (International Agency for Research on Cancer, 2007), despite advanced treatment modalities, many breast cancer women face a disruption of lymphatic system which predisposes women to risk of lymphedema (Paim et al, 2008), which is approximately 30% (Paskett, et al 2007).

A broad spectrum of risk factors resulting in arm morbidity has been suggested: mastectomy, auxiliary lymph node dissection (ALND), radiotherapy, chemotherapy, time elapsed since surgery, and tumor in upper lateral quadrant (Yen, 2009).

Clinically, many women treated for breast cancer have not received any information about lymphedema and risk reduction (Rinder, 2006), and psychologically, survivors feel depressed and have disruption of their interpersonal relationship (Fu, 2008). Because of this providing information about lymphedema for women treated for breast cancer is very important.

Lymphedema and functional impairment are well-established as sequelae of breast cancer treatment which affects an increasing number of women due to continually improved survival (Mouridsen, 2008).

Estimates of breast cancer related lymphedema (BCRL)

incidence and prevalence vary considerably in the literature due to a lack of standardized diagnostic criteria and measurement procedures (Armer, 2005). The complexity and variability of the lymphatic system and the unpredictability of risk factors make it difficult to predict which breast cancer patients will ultimately develop BCRL. Research is needed to determine how BCRL education affects the cognitive and symptom outcomes of breast cancer women; so that it will be possible to develop effective strategies to help patients reduce their BCRL risk (Fu et al, 2010).

## Significance of Lymphedema

Lymphedema is accompanied by distressing symptoms such as pain, fatigue, and decreased range of motion and skin breakdown, sensation of tightness and numbness of the affected site. In a study conducted in 2009 they noted that numbers of breast cancer women with lymphedema develop cellulitis and lymphangitis twice as often than those without (Shih, 2009), so providing information is very important.

The goal therefore is to provide nurses with needed information about lymphedema incidence, treatment, nursing implications of treatment of lymphedema signs and symptoms.

This paper is guided by self care deficit theory in nursing of Orem. She explains how individuals practice self care in order to maintain health, She also puts the responsibility of care in the hands of the patients complaining of lymphedema.

The objectives of this paper are to:

- Identify the main clinical presentation of lymphedema.
- Identify the differential diagnosis in lymphedema patients.
- Discuss the nursing interventions and clinical implications related to lymphedema.

## Pathophysiology

As long as the lymphatic loads remain lower than transport capacity of the lymphatic system, lymphatic compensation is successful; lymphedema is caused by mechanical insufficiency.

A number of pathological conditions, which include surgery, radiation, and infectious disease (i.e. cellulitis in upper arm), result in a diminished lymph fluid flow. The fact is that lymphedema occurs only in a percentage of patients following extensive disruption of the lymph system like radical mastectomy and/or radiation therapy (Armer, 2009).

As a result As a result of diminished lymph flow, intralymphatic hydrostatic pressure is increased, and lymph vessels become progressive congested and dilated. Lymph is consequently accumulated in the involved limb, resulting in lymphedema formation (Sakorafas, 2006).

## Clinical Presentation

Less lymphedema and fewer related symptoms were reported in patients who underwent sentinel lymph node biopsy (SLNB) only in comparison to patients who underwent ALND or SLNB plus ALND (Paim et al., 2008).

In early stages of lymphedema formation, the involved extremity present a swelling, and with impairment of lymphatic system the involved upper limb may appear the characteristics features of indurations and fibrosis, these



changes cause destruction due to proliferation of fibroblast and keratinocyte, from these the girth of involved arm will increase (Kwan, 2002).

Many patients with lymphedema may appear asymptomatic, but others may complain from numbness, pitting edema, limitation on movement, pain, presence of sign of infection (Schmitz, 2009 & Fu, 2009).

### Differential Diagnosis

Several factors make diagnosing post-breast cancer lymphedema clinically challenging. The fact that there are no universally recognized diagnostic criteria, clinicians' failure to properly evaluate its symptoms, and the presence of coexisting conditions (Fu, 2009), such as to rule out conditions that may cause similar symptoms, which include heart, thyroid problems, liver disease and kidney problems, but if there is persistent swelling in the arm, legs, and lymph nodes, they can use additional diagnostics tests which may be performed if lymphedema is suspected:

- Radionuclide imaging of lymphatic system (lymphoscintigraphy) using dye injections.
- Magnetic Resonance Images (MRI) scan.
- Computerized Tomography (CT) scan.

Water displacement, is considered the gold standard for limb volume measurement, and is known to be a sensitive and accurate measure in the laboratory setting, but is rarely used in clinical settings because it is cumbersome and messy (Armer, 2005).

Assessment tools like The Lymphedema and Breast Cancer Questionnaire (LBCQ), an assessment tool for Lymphedema signs and symptoms, consists of a 57 item questionnaire examining 19 signs and symptoms of LE (Armer et al., 2003).

### Treatment

There is no cure for breast carcinoma associated lymphedema, but management can often keep it from worsening (Fu, 2009). A variety of aggressive treatment interventions have been proposed for the control of symptoms and to minimize complications, by reducing upper limb swelling.

Decongestive lymphatic therapy is the most popular treatment for patients with lymphedema and includes manual lymphatic massage, compressive garments or bandaging or sleeves, or the application of intermittent pneumatic compression (intended to stimulate cutaneous lymphatic transport), and decongestive exercises (Sakorafas, 2006).

Patient education is the most important intervention for patients who have or are at risk of lymphedema development. Breast cancer patients need to be educated both preoperatively and postoperatively about the risk of lymphedema. These patients should start a program of upper limb exercises (elevation, gentle isometric exercises).

This should occur in the immediate postoperative period to promote gravity or passive drainage of lymph, in an attempt to prevent lymphedema formation (Sakorafas, 2006).

Pharmacological treatment of lymphedema has been limited, clinicians have used antibiotics as prophylactic due to fear of recurrent infections from cellulitis, and also they used benzopyrones (coumarin) to treat lymphedema, but they have limited use due to ineffective usage. It is used in Japan where it has been found to be very effective, while in the United Kingdom (Britton, 2009) and the United States (Farinola, 2005) it is not licensed. Coumarin has been found to be hepatotoxic and ineffective for treating lymphedema; diuretics can increase interstitial protein concentrations, making inflammation and fibrosis more likely (Fu, 2009).

### Discussion and Nursing Implication

Isenberg, 2001 describes a supportive and educational system as consisting of helping action that includes a combination of support, guidance, provision of developmental environment and teaching; from these it aims to identify crucial factors in prevention, early detection and treatment of lymphedema.

In lymphedema, two additional dimensions of nursing care should not be overlooked: patient education and psychosocial health. Patient education is critical both for the prevention and management of lymphedema, especially for cancer patients. Psychosocial issues may be addressed by group or individual counseling, along with practical information on diet and exercise, and advice for picking comfortable and flattering clothes.

Arm swelling remains a common problem following breast cancer treatment, since no definitive cure exists currently, so preventive action by limiting or/and eliminating risk factors is very important, because it doesn't disappear and can get worse with time. Prompt intervention with appropriate therapeutic measures may not only prevent progression, but it might return to normal limits.

Breast cancer women remain at risk for lymphedema throughout their lives (Fu, 2009); it may cause discomfort, pain, impaired function and emotional distress within three years of breast cancer diagnosis. Overall we need to develop and implement strategies for lymphedema prevention and management and education for all breast cancer women.

Any nurse should know that women with breast cancer are divided into two dimensions, management and risk reduction of lymphedema. In management, and to be most effective, activities like manual lymphatic drainage should be performed daily, as well as teaching

breast cancer women about cognitive, psychological, social coping skills and emotional support.

We as nurses and other health care providers can assess the breast cancer women for lymphedema and provide health education on risk reduction and early detection to prevent further complications. It is important that nurses periodically reassess breast cancer survivors for lymphedema by using a tool such as the 19 item Lymphedema and Breast Cancer Questionnaire.

In risk reduction pretreatment education should include a review of the lymphatic system and how its disruption causes lymphedema, a description of lymphedema signs and symptoms, and discussion of risk-reduction strategies. After treatment, nurses should continue to review these topics at each clinical visit and ask whether the patient is experiencing any signs and symptoms.

Education should address skin care; for example, breast cancer survivors should avoid skin breaks when possible and should treat cuts, insect bites, and burns immediately with a topical antibiotic.

Clinicians and other care providers need to educate patients about the risk of developing lymphedema after surgery or radiation therapy; how to recognize lymphedema symptoms early, and how to manage the condition. Nurses will need to advise patients, for instance, to wear loose-fitting clothing, not to cross their legs while sitting, and to avoid sitting in one position for more than 30 minutes.

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# INFECTION WITH CHRONIC DIABETIC WOUNDS (DETECTION, CLASSIFICATION AND TREATMENT)

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## Abstract

Diabetes mellitus is one of the common diseases. Its prevalence is increasing globally. Diabetes is among diseases which are characterized by affecting all body systems. Wounds are a nightmare for diabetics. Most diabetics are afraid of being injured. Uncontrolled diabetes is among the causes of increased chance of infection in wounds and is considered a cause of poor healing. In our review we will discuss the risk factors of infection in chronic wounds and the signs of infection in these wound as well as discussing the differences between superficial and deep infection.

## Introduction

The ability of the host to resist microbial interference is the most important determinant of chronic wound infection and involves many different local and systemic components.

These components include:

### 1) Locally:

- o The size and location of the wound: The larger the wounds the greater the risk of infection. Larger wounds are associated with heavy microbial burdens. The location of the wound may determine the risk of wound infection.
- o Age of the wound: Chronic wounds of long duration (>6 months) are more likely to become infected and microbes have a chance to invade deep tissues and bone.
- o Vascular perfusion: Inadequate local vascular supply leading to poor tissue oxygenation will favor microbial proliferation, increase the risks of infection and reduce the likelihood of healing. Wounds are generally deemed healable if tissue oxygen partial pressure is  $\geq 40$ mmHg and difficult to heal if below 20mmHg.
- o Presence of devitalized tissue or foreign bodies: Devitalized tissues including eschar and slough are food sources for bacteria.

### 2) Systemically:

- o Behavioral determinants: some individuals may have difficulty adhering to the treatment due to a lack of understanding, poor motivation and depression. Poor personal hygiene, alcohol, and smoking may also interfere with wound healing. Failure to maintain adequate nutrition affects wound healing.
- o Social determinant: Education and socioeconomic background are an important issue that can affect wound healing.
- o Associated co-morbidities: Poorly controlled diabetes increases the risk of infection through hyperglycemia and inadequate neutrophil function. Chronic liver and renal impairment as well as immune suppressing therapies and chronic viral infections are conditions associated with peripheral edema that reduce local host defense and increase the risk of infection.

### Classic signs of infection in a chronic wound

When invasion of an offending organism occurs, the cardinal signs of localized infection develop.

The question is are there subtle signs to diagnose wound infection. In our opinion this is a difficult question especially if we know that there is no international consensus on this.



**Traditional Criteria**

- 1) Abscess
- 2) Cellulitis
- 3) Discharge :
  - a) Serum exudates with inflammation
  - b) Serupurulent
  - c) Haemopurulent
  - d) Pus

**Suggested additional criteria**

- a) Delayed healing (compared with normal rate for site and condition)
- b) Discoloration
- c) Friable granulation tissue which bleeds easily
- d) Unexpected pain/tenderness
- e) Pocketing at base of wound
- f) Bridging at base of wound
- g) Abnormal smell
- h) Wound break down

**Table 1 : Criteria addressed by Gardner assists in the identification of infection in granulating wounds**

Actually, it is not new that infection can affect wounds ,either acute or chronic, but the issue is how to predict infection early.

Why are researchers not working on defining criteria for wound infection?

In the United States one study done in 1964 reported an overall incidence of postoperative wound infection of 7.4% in 15,613 operations and a more national study in the UK showed that, following surgery or traumatic events 5% of wounds will become infected.

Wound infection has a negative impact on health resources. It was found that wound infection has been found to cause 290 additional bed days for one group of 40 surgical patients. In the USA , the cost of surgical infection was found to be \$9.8 billion. The indirect cost was also high.

For these reasons, work on finding criteria for early detection of infection and their validity is occupying the heads of the scientists.

Back as far as the 1st century AD, a Roman physician, Cornelius Celsus described the four classical signs of infection; rubor (vasodilatation), calor (increased temperature), dolor (painful cytokine-mediated stimulation of nociceptive nerve fibers and nerve damage) and tumor (increased vessel permeability leading to edema) (1).

It is uncertain how accurately classic signs of acute infection identify infection in chronic wounds.

Gardner published a paper in the journal of Wound repair and Regeneration (2). In this paper Gardner examine the validity of classic signs and the signs specific to secondary wounds (see(Table 1).

Gardner concluded that the signs specific to secondary wounds were better indicators of chronic wound infection than the classic signs with mean sensitivity of 62% and 38% respectively (2).

Interestingly, Gardner stated that increasing pain and wound breakdown were both sufficient

indicators of infection with specificity of 100%.

Cutting and Harding (3) brought the attention of many clinicians to subtle criteria that may not have previously been considered. The beauty of this criteria is that it is in the format of a reminder or checklist (3).This criteria has been tested and showed a good level of validity (2).

The only signs that did not demonstrate validity was pocketing of the wound base.

Differences in opinion is a healthy sign in medicine; Marks et al (4) did not agree with this finding. He and his colleagues found that pocketing at the base of the wound was found to be indicative of deficient granulation tissue due to an uneradicated infection.

One of the weak points in the work of Cutting and Harding is that their criteria do not differentiate between different types of wounds which is important to enable accurate differentiation of infection.



Letter	Sign	Comments
N	Non – healing wound	<ul style="list-style-type: none"> <li>- Non healing wound despite appropriate interventions</li> <li>- Bacterial damage leads to pro-inflammatory wound environment that delays healing</li> </ul>
E	Exudate that has increased	<ul style="list-style-type: none"> <li>- Exudate is often clear before it becomes purulent or sanguineous</li> <li>- Increased exudate needs to trigger the physician to look for subtle signs of infection</li> </ul>
R	Red friable granulation	When the wound bed tissue is bright red with exuberant granulation tissues and bleeds easily, bacterial imbalance can be suspected
D	Debris on the surface	- Necrotic tissue and debris in the wound is a food source for bacteria and can encourage bacterial imbalance
S	Smell from wound	Smell from bacterial by products caused by tissue necrosis associated with inflammatory response is indicative of wound released bacterial damage e.g. Pseudomonas has a sweet characteristic smell and green color.

Table 2: Superficial infection (NERDS)

Recently work has commenced on identifying infection in different wounds (5).

Although the wound infection criteria are helping in early detection of infected wounds, they have no high sensitivity and there is still need for bacteriological confirmation.

Bacteria can delay healing in chronic wounds through damage in a superficial or deep compartment. Topical treatment is usually adequate if bacterial damage is superficial and systemic therapy is often indicated if deep bacterial damage is suspected.

Superficial damage can be documented through the mnemonic

NERDS(6) (Table 2 ). Deep damage can be documented through the mnemonic STONE (1) (Table 3 - next page).

The ecology of wounds is complex and most chronic wounds host polymicrobial flora, containing a range of 1.6- 4.4 bacterial species per ulcer (7). Interestingly, 90%

Letter	Sign	Comment
S	Increased wound size	Only very deep wounds need to have depth measured with a probe
T	Increased surrounding skin temperature	This can be performed crudely by touch with gloved hand or by using an infrared thermometer or scanning device, there is >3 F difference between 2 mirror image sites.
O	Probing or exposed opening	There is high incidence of osteomyelitis if there is exposed bone or you can probe to the bone.
N	New or satellite areas of breakdown	Look for causes such as infection
E	- Erythema - Exudate - Edema	This is due to inflammatory response.
S	Smell	Bacteria that invade tissue have a foul odor. Make sure the smell is from organisms and not the normal distinct odor from the interaction of exudates with some of the dressing material

Table 3 : Deep infection (STONE)

of ulcers without clinical signs of infection still contain more than 1 species of bacteria (8).

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Clinical presentation	Complex infection	Simple infection
<b>Mild:</b> <ul style="list-style-type: none"> <li>✓ Superficial</li> <li>✓ No systemic response</li> <li>✓ No Osteomyelitis</li> </ul> <b>Ambulatory management</b>	Clindamycin 300-450mg QID +Ciprofloxacin 500mg BID (or Moxifloxacin 400mg OD) X 14day	Cephalexin 500mg PO QID x 14days
<b>Moderate</b> <ul style="list-style-type: none"> <li>✓ Superficial to deep</li> <li>✓ +/- systemic response</li> <li>✓ No Osteomyelitis</li> </ul> <b>Ambulatory or in-patient management</b>	Clindamycin 600mg PO TID +Ciprofloxacin 500mg BID X 14day  Clindamycin 600mg PO TID + Ceftriaxone 1g/iv Q24H X 2-12 wks  Vancomycin (MRSA) 1g/iv Q12H X 14days	Clindamycin 600mg PO TID +Ciprofloxacin 500mg PO BID X 14day
<b>Severe</b> <ul style="list-style-type: none"> <li>✓ Deep</li> <li>✓ Systemic response</li> <li>✓ +/- Osteomyelitis</li> <li>✓ Limb/life threatening</li> </ul> <b>Inpatient management</b>	Clindamycin 600mg PO TID + Ceftriaxone 1g/iv Q24H X 14days  Imipenem 500mg/IV Q 6h X 14days  Vancomycin (MRSA) 1g/iv Q12H X 14days	Clindamycin 600mg PO TID + Ceftriaxone 1g/iv Q24H X 2-12 wks

Table 4 : Clinical presentation and treatment options

(References continued from Asthma and the Cumulative Effects of Climate Change, The Financial Crisis and Swine Influenza page 12)

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